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THE HOST RANGE OF *FALCONIA INTERMEDIA* (DISTANT) (HEMIPTERA: MIRIDAE): A POTENTIAL BIOLOGICAL CONTROL AGENT FOR *LANTANA CAMARA* L. (VERBENACEAE)

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Abstract.—The mirid bug *Falconia intermedia* (Distant) is endemic to the Neotropics where it is found on various species of *Lantana*. Host range tests were conducted in Mexico to ascertain whether the insect warranted further consideration as an agent for the biological control of *Lantana camara* which is a serious weed in many tropical and subtropical countries. In these tests, *F. intermedia* oviposited, and immatures developed, only on *L. camara;* evidence that the bug was narrowly stenophagous. Permission to introduce this insect into quarantine facilities in Queensland for further study was obtained.

Key Words: Mexico, biocontrol of weeds, *Adfalconia*, introduction into Australia

The woody shrub *Lantana camara* L. (family Verbenaceae; subfamily Verbenoideae) is a very serious rangeland weed in many sub-tropical and tropical countries (Palmer and Pullen 1995) and has long been a target for biological control (Perkins and Swezey 1924). During a recent survey of North America (Palmer and Pullen 1995), *Falconia intermedia* (Distant) (Hemiptera: Miridae) was found feeding on and damaging various *Lantana* spp. and was identified as a potential biological control agent for lantana. *Falconia* is a poorly known Neotropical genus comprised of 24 morphologically diverse species (Schuh 1995). The generic placement of some species, including *F. intermedia*, and their relationship to the genus *Adfalconia* are in need of study (T. J. Henry, personal communication).

This report describes aspects of the biology, phenology and host range of *F. intermedia* determined during our study of the insect in 1991 to support an application to import *A. intermedia* into quarantine facilities in Australia for more detailed studies.

Biology

The eggs are a translucent pale green with a brownish operculum. They are elongate-elliptical in longitudinal section with the operculum flattened, and round in cross-section. The eggs are inserted into the leaf at the anal end via a small stalk-like process (J. R. Baars, personal communication). Most eggs are also covered to a greater or lesser extent in a black or dark reddish resinous substance which can sometimes coat the entire egg except the operculum. Eggs are placed individually or in groups of 2–3 over the whole of the underside of leaves.

Under high densities, eggs may also be found along the invaginated veins on the adaxial leaf surface.

The 1st instar is pale green with red eyes. The nymphs are very active and quickly move to the other side of the leaf when disturbed. At high densities, nymphs were observed to wander along stems and move from the plant onto the litter surface. Nymphs develop through to adults in approximately 15–20 days. Male adults straddle final instar female nymphs, and mating occurs soon after the female undergoes its final moult.

Phenology, Host Range, and Distribution

Falconia intermedia was found on three species of *Lantana* all of which are within the section *camara; L. camara, L. urticifolia* Mill. and *L. hirsuta* Mart. & Gal. It occurred throughout the growing season (July–January) but populations increased as the season progressed. Large numbers were sometimes found causing obvious damage to their host plants towards the end of the growing season. Heavily infested plants assumed a yellowish-silver look and could be recognised as stressed from a distance.

We also collected *Falconia semirasa* (Distant) from *Lippia myriocephala* Schlecht. and Cham., another verbenaceous host. The hosts of other species of *Falconia* and *Adfalconia*, however, are generally not known, but none is known to be detrimental to agricultural crops.

The insect was found at various localities in Mexico, including Jalapa and Córdoba (State of Veracruz) and Cuernavaca (State of Morelos). It was also found at various locales in Honduras where it appeared to be more generally distributed.

Materials and Methods

The following host specificity studies were conducted in Cuernavaca, Mexico:

(1) First experiment.—Eight plant species closely related to and including *Lantana camara* were selected for the experiment (Table 1). One potted plant of each species was placed into a standard gauzed cage (1 × 1 × 0.6 m) so the insects could freely choose between the eight plant species. Each cage, with its eight plant species, represented a replication.

Table 1. Numbers of nymphs and adults found on various plant species in two experiments conducted to determine the host range of *F. intermedia*.

Plant Species	Experiment No.	Mean No. of Nymphs	Mean No. of Adults
Verbenacea			
Lantana camara L.	1	82.0	6.5
Lantana camara L.	2	27.5	5.0
Lantana montevidensis (K. Spreng.) Briq.	2	0.0	0.0
Verbena carolina	1	0.0	0.0
Clerodendrum sp.	1	0.0	0.0
Duranta repens L.	2	0.0	0.0
Petrea volubilis L.	1	0.0	0.0
Lamiaceae			
Ocimum basilicum L.	2	0.0	0.0
Ajuga reptans L.	2	0.0	0.0
Salvia splendens F. Sellow ex Roem. & Scult.	1	0.0	0.0
Nepeta mussinii K. Spreng. ex Henckel	1	0.0	0.0
Bignoniaceae			
Jacaranda mimosifolia Humb. & Bonl.	2	0.0	0.0
Boraginaceae			
Borago officinalis L.	1	0.0	0.0
Borago officinalis L.	2	0.0	0.0
Solanaceae			
Lycopersicon lycopersicum L.	2	0.0	0.0
Solanum melongena L.	1	0.0	0.0

Adult insects were collected by aspiration from a laboratory culture which had been established using material collected from *L. hirsuta* growing near Jalapa. Twelve adults were introduced into the first cage and 30 adults into a second. No attempt was made to place them on *L. camara*. The plants were observed every few days and at the end of 6 weeks the plants were bagged. The leaves of each plant were then examined under a microscope and nymphs and adults counted.

(2) Second experiment.—A similar de-

sign to the first experiment was used with a different selection of eight plant species (Table 1) being utilized. The insects were also taken from the laboratory culture described above. This time three leaves infested with all stages of the insect were attached to each of the test plants with paper clips. Observations were again made every few days and after approximately six weeks all the plants were bagged and assessed under the microscope.

Results

(1) First experiment.—The mirid was not seen on any plant other than *L. camara* during the period of observation. On *L. camara*, both the insect and mottling of the leaves caused by feeding were seen. Counts at the end of the trial revealed that both nymphs and adults were present on the *L. camara* but were not present on any other plant (Table 1).

(2) Second experiment.—During the course of the experiment the mirid was not seen on any plant other than *L. camara*. On this plant both the insect and mottling of the leaves were seen. Counts at the end of the trial revealed that both nymphs and adults were present on the *Lantana camara* but were not present on any other plant (Table 1).

Discussion

Based on these tests, *F. intermedia* would appear to be a promising biocontrol agent for lantana. Particularly favourable characteristics are its ability to attain high populations very quickly and to damage the plant considerably as seen by field observations.

The two host range trials indicated that this mirid has a very limited host range. Although the host testing list was not extensive (comprising 13 plant species) it did include phylogenetically close taxa and should accurately indicate the host range of this insect. These studies therefore indicate that *F. intermedia* warrants further study to obtain approval for its release in Australia and in other countries such as South Africa where lantana is also a problem.

The insect was imported into quarantine facilities in Brisbane in 1993 and again in 1994 but in both instances failed to survive on the cultivars offered as hosts. Imported adults successfully oviposited but emerging nymphs did not survive beyond a few days. Further experimentation in collaboration with scientists in South Africa is planned to determine what factors caused the demise of the laboratory colonies. Unfavourable laboratory conditions or unsuitable Australian cultivars are suggested.

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